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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/720,035
Filing Date: November 21, 2003
Appellant(s): TSANG ET AL.

January 16, 2009

Michael Lynch
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/2/08 appealing from the Office action mailed 5/12/08.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

11/240,280

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

No evidence is relied upon by the examiner in the rejection of the claims under appeal.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the appellant regards as his invention.

9.1 Claims 23-25, 27-29, and 79-82 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In the specification, appellant states large scale electrical energy generation as the object of his claimed invention, as evidenced by the following statements:

> *"More specifically, it is an object of the present invention to provide a self-contained method and apparatus for converting nuclear power to electrical power that can generate large amounts of electrical power for long periods of time without the need for frequent refueling and require little or no maintenance. Another object of the present invention is to provide a method and apparatus hat meets the long felt need for a method of converting nuclear energy to electrical energy that is small in size, reliable and can generate large amounts of electrical energy for use in submarines, surface ships, and as a battery to power a whole range of products--including, for example, military equipment, satellites and space vehicles." Underlining provided. See paragraph bridging pages 7 and 8.*

> *"The present invention is very adaptable because multiple nuclear voltaic cells--comprising any of the embodiments described above, i.e., embodiments 1, 2, 3, or 4--may be linked together to form a critical array, described as embodiment 5 above, to provide power up to and exceeding the megawatt range." Underlining provided. See page 12, lines 3+ of the specification.*

As appellant himself admits, his invention is designed for high capacity electricity generation for transmission and distribution, and/or for powering large transport vehicles (e.g., submarines and ships). Any one of these claimed applications require a system equivalent to a nuclear power plant in the range of about 1000 Megawatts. In fact, appellant highlights the high conversion efficiency and low maintenance requirements of his claimed invention over other techniques of converting nuclear energy into electrical energy, including nuclear power plants and solid semiconductors. For example, appellant states:

> *"Theoretically, the best methods for converting nuclear energy into electrical energy should be direct methods where the nuclear energy is directly changed into electrical energy; The nuclear power plant discussed above involves an indirect, two-step process in which the nuclear energy is transferred into thermal energy that causes water to turn to steam that is used to drive turbines and create electrical energy. Direct conversion methods are potentially the most efficient conversion methods because they would avoid the inherent energy loss during each conversion process.. " See paragraph bridging pages 3 and 4 of the specification.*
>
> *"The potential conversion efficiency of the solid semiconductor system is high. However, the solid semiconductor method of converting nuclear power cannot be used to produce large power outputs for extended periods of time because the high energy radiation that enters the solid semiconductor also causes damage to the semiconductor lattice. Furthermore, if the energy source is fissile material, some of the fragments of fissile material that enter the solid semiconductor remain in the solid semiconductor. The introduction of trace amounts of defects, including native and impurity point defects and extended defects, can significantly reduce semiconductor device performance. Over time the solid semiconductor is degraded and efficiency decreases until it is no longer useful for power conversion. Consequently, even though systems using solid semiconductors as direct converters of nuclear energy to electrical energy are potentially very efficient, they are often impractical for high power, long duration applications" See page 5, lines 1+ of the specification.*

Notwithstanding all this claimed novel and superior features of the invention, the specification provides nothing more that the following short description of the claimed embodiment:

> *"In another preferred embodiment, the present invention may also be used to construct a nuclear voltaic battery. In Embodiment 8, described above, the nuclear material in the form of a*

radioactive isotope is dissolved in a liquid semiconductor. Dissolving the radioactive isotope in the liquid semiconductor is a preferred embodiment of the invention, however, in another embodiment the radioactive isotope may instead be positioned in close proximity to the liquid semiconductor. Nuclear energy in the form of alpha, beta, and/or gamma radiation enters the liquid semiconductor and creates electron-hole pairs. The liquid semiconductor is an n-type or p-type semiconductor that is sandwiched between two metal contacts that are selected so as to create a Schottky diode and a low resistance or Ohmic contact when placed in contact with the n type or p-type liquid semiconductor. A built-in field is produced within the depletion region of the liquid semiconductor that causes electrons and holes generated either in the depletion width or within a few diffusion lengths of it to move in opposite directions. This results in the generation of a current. By placing a load on the contacts of the present invention electrical power is generated. In a preferred embodiment, the nuclear voltaic cell is constructed by wrapping the layers of materials around a mandrel in a spiral fashion." See page 13, lines 3+ of the specification.

There is neither an adequate description nor enabling disclosure as to:

a) what are the minimum voltage and current to form a working nuclear voltaic cell (e.g. to generate a 1000 megawatt power);

b) what level of purity is required for the liquid semiconductor (i.e., prior to introduction of chalcogen material);

c) what are the temperature, flow and pressure levels of the system;

d) what should be the volumetric or weight ratio of chalcogen to the liquid semiconductor;

e) how and in what manner is it assured that nuclear decay products are sufficiently removed by the scrubber from the liquid semiconductor to minimize radiation damage (note that the ability to "self-heal" is an attribute of a liquid semiconductor that appellant alleges as a distinct advantage over solid semiconductors, and therefore minimizing radiation damage is critical to the invention);

f) what is the required minimum enrichment for the chalcogen.

It is thus considered that the examiner (for the reasons given above) has set

forth a reasonable and sufficient basis for challenging the adequacy of the disclosure. The statute requires the appellant itself to inform, not to direct others to find out for themselves; In re Gardner et al, 166 U.S.P.Q. 135, In re Scarborough, 182 U.S.P.Q. 298. Note that the disclosure must enable a person skilled in the art to practice the invention without having to design structure not shown to be readily available in the art; In re Hirsch, 131 U.S.P.Q. 198.

9.2 Claims 23-25, 27-29, and 79-82 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The means scrubbing the liquid semiconductor of nuclear decay products is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew,* 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). Note that scrubbing and purifying the liquid semiconductor is critical to the claimed invention, as appellant himself admits in the following statement:

> *"The introduction of trace amounts of defects, including native and impurity point defects and extended defects, can significantly reduce semiconductor device performance. Over time the solid semiconductor is degraded and efficiency decreases until it is no longer useful for power conversion.* See *paragraph 0014 of the specification.*

9.3. Claims 23-25, 27-29, and 79-82 are rejected under 35 U.S.C.. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: means for that scrubbing and purifying the liquid semiconductor.

(10) Response to Argument

10.1 Non-enablement

Appellant argues that "the stated bases for rejection are based on an improper extrapolation from Appellants' specification, and upon improper conjecture based on that extrapolation." Appellant then asserts that "the only specific power output identified by the Applicant is 'power up to and exceeding the megawatt range'." Appellant also asserts that the invention being claimed is "just a single nuclear voltaic cell." See pages 12 and 13 of the Brief.

The examiner disagrees.

First, appellant is essentially hunting for an alternative utility for his invention, at this late stage of the prosecution, to substitute for the utility repeatedly recited in the specification. Both the Background and Summary of the application are clearly directed to comparing the claimed invention to other forms of large-scale electrical power generation and to showing that that the invention is more advantageous than these other power forms. Note, for example, the following statements:

"Nuclear power plants, in general, have energy conversion rates of between 30 and 40 percent. This efficiency rate is very good considering that several steps are used in such power plants to convert the nuclear energy to electrical energy. Consequently, nuclear power plants are a good source for large-scale generation of electricity. However, apparatus that use heat transfer techniques for generating electricity from nuclear energy are, in general, large and inefficient for small-scale power conversion." Underling provided. See page 2, lines 20-25 in the Specification.

"Theoretically, the best methods for converting nuclear energy into electrical energy should be direct methods where the nuclear energy is directly changed into electrical energy. The nuclear power plant discussed above involves an indirect, two-step process in which the nuclear energy is transferred into thermal energy that causes water to turn to steam that is used to drive turbines and create electrical energy. Direct conversion methods are potentially the most efficient conversion methods because they would avoid the inherent energy loss during each conversion process." Underlining provided. See page 3, lines 6-13 in the Specification.

It is clear that the purpose of the invention is for large power electrical power generation, and the claims when read in the light of the disclosure, are not enabled.

Note in regard to appellant's utility search attempt, Brenner v. Manson, 148 UPQ 689, where the Court said:

> "The basic *quid pro quo* contemplated by the Constitution and the Congress for granting a patent monopoly is the benefit derived by the public from an invention with substantial utility. Unless and until a process is refined and developed to this point – where specific benefit exists in currently available form – there is insufficient justification for permitting an applicant to engross what may prove to be abroad field.
>
> ***
>
> "This is not to say that we mean to disparage the importance of contributions to the fund of scientific information of something 'useful', or that we are blind to the prospect that what now seems without 'use' may tomorrow command the grateful attention of the public. **But a patent is not a hunting license.** It is not a reward for the search, but compensation for its successful conclusion. '[A] patent system must be related to the world of commerce rather than to the realm of philosophy. ***' [underlining provided, footnote omitted]."

Second, appellant objects the examiner's framing the rejection based on the recited purpose of the invention. The 1000 megawatt figure is typical power level of nuclear power plants for generating the large electrical power that he offers as use of his claimed invention. Appellant's assertion that "the only specific power output identified by the Applicant *[sic]* is 'power up to and exceeding the megawatt range'", actually comports with the examiner's position because 1000 Mw is a value "exceeding the megawatt range."

Third, during a June 6, 2007 interview, the appellant and his representatives brought a sample of the proposed invention (i.e., a nuclear voltaic cell) to show to the examiner. The cell had dimensions that are comparable to a push-pin, which one uses to tack, e.g., a map on the wall. When asked by the examiner how much power the cell generates, the appellant indicated a value that is significantly less than **one ampere.**

If one generously assumes that a single cell generates one watt (1 watt = 1 ampere x 1 volt), then appellant's admitted lowest power level of one megawatt will require one million of these individual cells connected to each other. Therefore, the enablement issues raised by the examiner in section 9.1 above become even clearer. For example, how does one ensure that the connections of these million individual cells remain structurally sound, how does one know which cell needs to be refilled with the nuclear material solution that inherently becomes depleted, etc.

Fourth, in an effort to justify that the purpose of the invention is not to generate the power comparable to a typical nuclear power plant, which is not the case as demonstrated above, the appellant cites the below underlined passage from the specification:

> *"The present invention is very adaptable because multiple nuclear voltaic cells--comprising any of the embodiments described above, i.e., embodiments 1,2, 3, or 4--may be linked together to form a critical array, described as embodiment 5 above, to provide power up to and exceeding the megawatt range. For small power needs a single or small number of cells may be used." See page 14 of the Brief.*

The specification does not define the term, "small power." However, from the context of the preceding sentence that embodiment 5 provides power exceeding the megawatt range, one can reasonably consider 10% of one million watts (or 100,000 watts) to constitute "small power."

Again, assuming a generous 1 watt per cell, appellant's asserted "small power" generation will require 100,000 cells connected together! The enablement issues raised by the examiner would still remain valid.

Even if one assumes "small power" to be equivalent to 1% (or even 0.1%) of the power generated in appellant's embodiment 5, still thousands of cells will be required, and the enablement issues remain.

Fifth, as to the assertion that only a single cell is being claimed, this further supports the lack of enablement rejection of the examiner because the specification does NOT disclose any other purpose of this cell except for large power generation. Therefore, if this single cell were to generate 1 million watts (i.e., lowest power level that the device is intended to produce) or 1,000 watts (i.e., 0.1% of 1 megawatt, equivalent to appellant's asserted "small power"), the cell will **VAPORIZE** instantly!

. 10.2 Examiner Questions on Specification

Appellant argues that "if the 6 questions raised in the Office Action were to be answered, they can only be answered by a specification that was, in fact. A blueprint for a specific nuclear voltaic cell-if even then." See page 15 of the Brief.

The examiner disagrees.

The questions raised by the examiner are not detailed engineering or scientific questions. Rather, they represent fundamental questions that go to heart of issue of whether or not the claimed invention can operate for the intended purpose stated in the specification, i.e., to generate large amounts of electrical power.

What is so complicated about the questions: a) "what are the minimum voltage and current to form a working nuclear voltaic cell?"; or b) "what is the required minimum enrichment for the chalcogen?" Information on these basic parameters is not in the disclosure. If indeed, the appellant has an operative embodiment for the recited purpose

of the invention, he can easily provide a one word answers. Since appellant refuses to provide an answer even to this simple question raises even more serious enablement/operability concerns. As an adjunct to the refusal to address the fundamental questions raised by the examiner on the specification appellant states,

> *"Applicants [sic] respectfully submit that the detailed intricacies of the invention addressed by the above identified questions would be within the level of skill of those familiar and experienced in the design of nuclear power sources." See paragraph bridging pages 16 and 17 of the Brief.*

This is self-contradictory.

If appellant himself, who is supposedly the individual intimately familiar with the invention cannot provide an answer to the simple questions on voltage and current per cell to exercise the invention, how can some other artisan, who does not possess the same degree of exposure to the invention as the appellant, be expected to answer the same simple question, let alone the other fundamental operational issues relating to the invention?

10.3 Invention has more than one utility, i.e. for submarines and ships

Appellant argues that there is another established utility for the claimed invention, aside from the electric power generation cited by the examiner and recited in the disclosure. Appellant cites the following:

> *"Another object of the present invention is to provide a method and apparatus that meets the long felt need for a method of converting nuclear energy to electrical energy that is small in size, reliable and can generate large amounts of electrical energy for use in submarines, surface ships, and as a battery to power a whole range of products--including, for example, military equipment, satellites and space vehicles." Underling by appellant. See page 21 of the Brief.*

The examiner disagrees.

Note again the reference to "*large amounts of electrical energy for use in submarines, surface ships.*" The primary user of large amounts of electrical energy generated by the reactors in nuclear submarines and the then nuclear-powered surface ships are their respective propulsion systems. These propulsion systems cannot run on a single nuclear voltaic cell of the appellant.

10.4 Missing Critical Elements

Appellant argues that "Applicants *[sic]* are not obligated to recite in the claims all components which might be considered necessary for a commercial product." See page 23 of the Brief. Underlining provided.

The examiner disagrees.

The missing elements identified by the examiner are not for a commercial product but for the claimed invention to be OPERABLE.

A "means for scrubbing the liquid semiconductor of nuclear decay products" is necessary for operation because these decay products are "nuclear poisons" that will impair/interfere with the fission process in the nuclear material of the liquid semiconductor, if they are not removed. In this case, the system cannot operate for "long periods of time with little or no maintenance" as appellant so-alleges. These decay products also inherently emit radiation that will expose of personnel involved with the operation and maintenance of the device. Since the device involves radioactive materials, it is subject to licensing of the U.S. Nuclear Regulatory Commission, and personnel doses, which must be maintained within regulatory limits, and radiation

shielding from the nuclear decay products are issues that are reviewed prior to grant of a license to manufacturing the device.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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